LBO – 510/511
LBO – 310/310A/311

OSCILLOSCOPE

SERVICE MANUAL

****

[WARNING]

This service manual is for use by qualified personnel only. To avoid electrical shock, do not perform any service in this manual unless qualified to do so.

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2nd edition Aug., 1987

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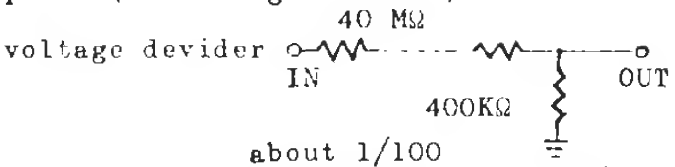
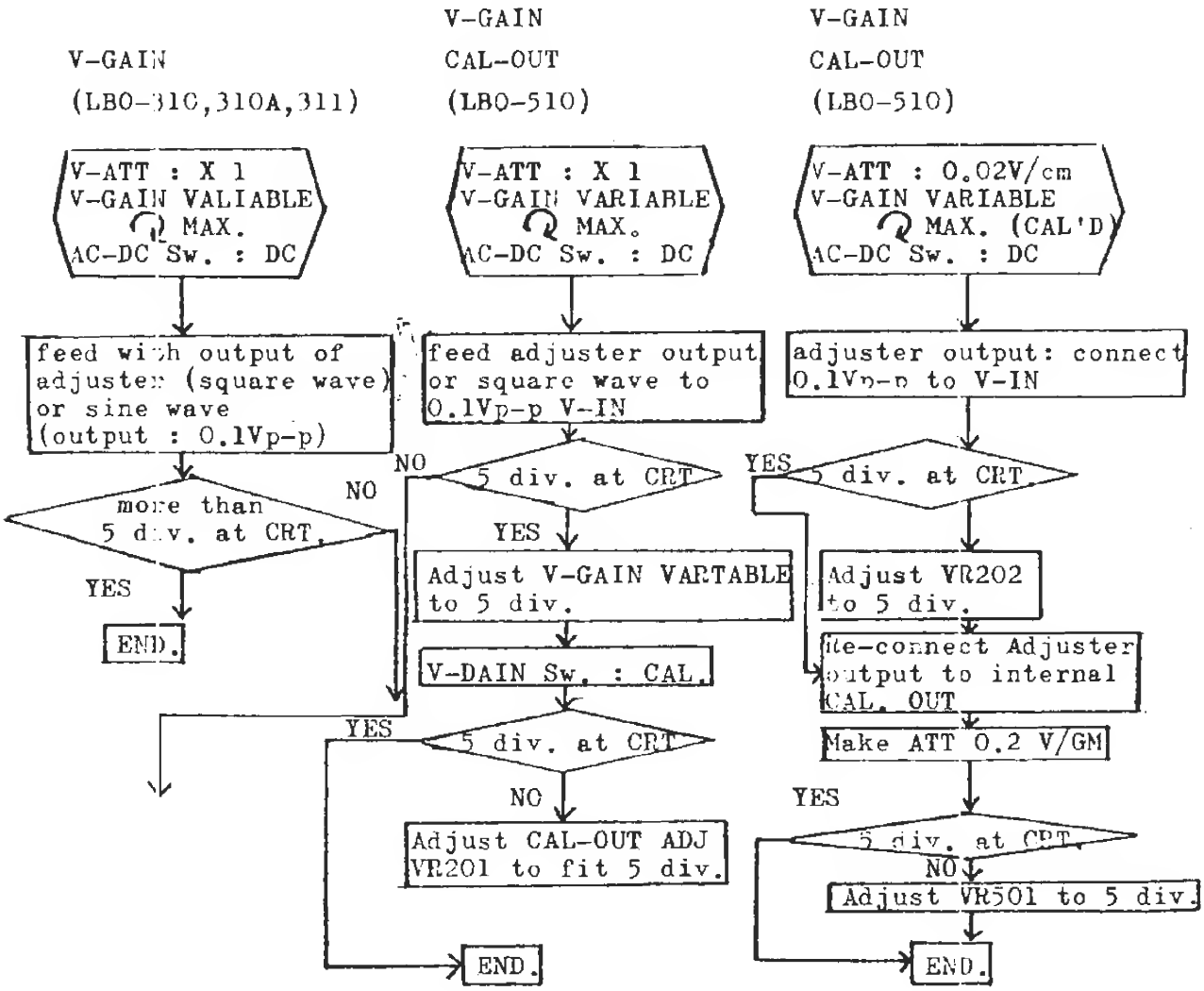
1. INSTRUMENST NEEDED FOR PEPAIR & ADJUSTMENT

1) DC volt meter
2) High-volteage probe (or voltage devider)



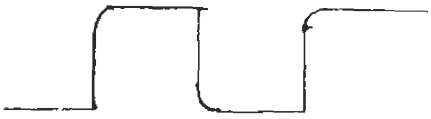
3) Triggered oscilloscope (DC to 7MHz e.g. LBO-503)
4) Audio oscillater (to cover 20Hz-10MHz)
5) Sensitivity caliblater (Should be 1kHz square wave oscillater, without sug or overshoot, to change output with 1-2-5- steps)

2. CHEKING ADJUSTMENT AND REPAIR.

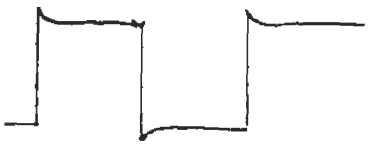


2) Check and adjust characteristic of Attenuator

Feed out-put (1KC square wave) signal from calibrator to V-IN.
(Signal shall be shown more than 5 diV. in CRT)
Observe waveform at CRT if shows the figures as below.
Adjust a trimmer to get right wave form.



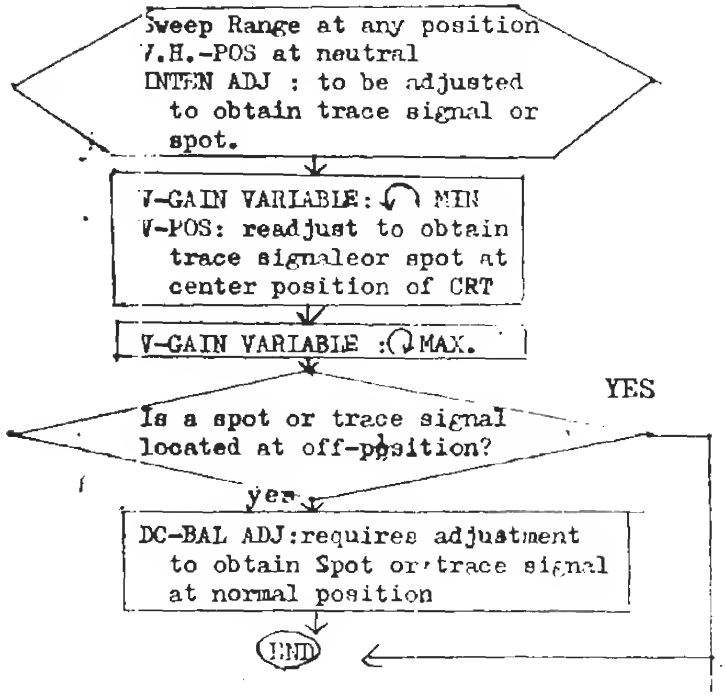
Distorted wave form 1



Distorted wave form 2

Normal

3) Check and adjust of DC-BAL
V-DC BAL ADJ



4) Check of sweep signal and sync

i) At every sweep frequency check sine carve of max and min. frequency to be shown in CRT. when feeding signal to obtain 1.DIV.

ii) Check whether it sync at every sweep freq. showing one cycle if sweep valiable turn to max. position at max. freq. and/or sweep valiable turn to min. position at min. freq.

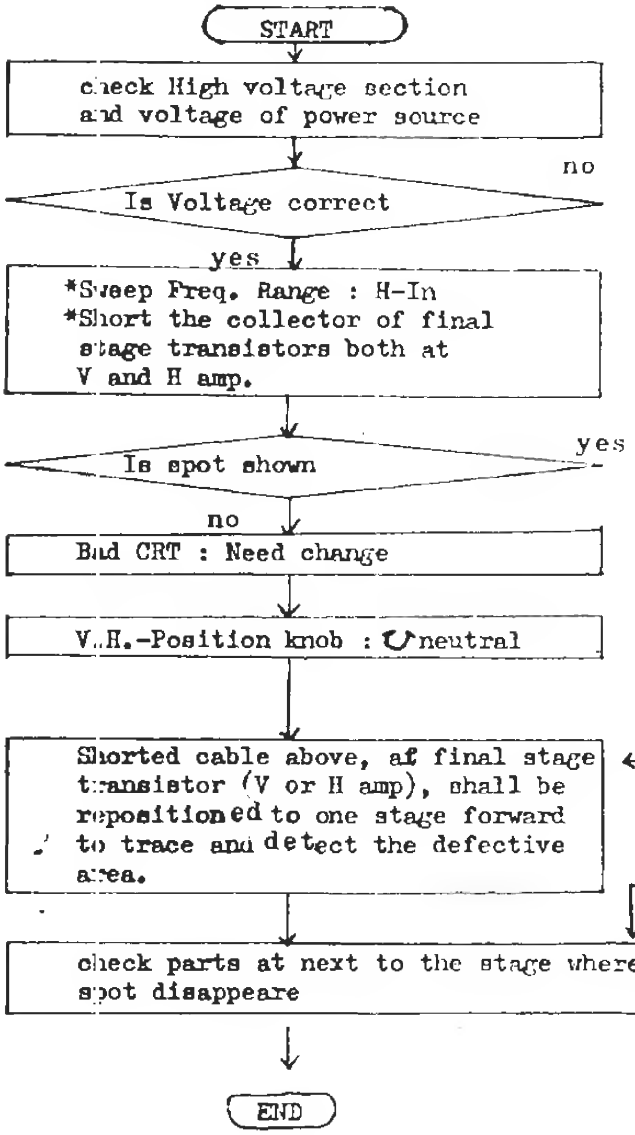
iii) If sweep freq. seems to be off calibrated in total toward high frequency side or low frequency side:

LBO-310	Adjust at
" 310A	VR401
" 311	(Freq ADJ or
" 511	BIAS ADJ)
LBO-510	Adjust at VR301 (Freq.ADJ)

iv) If sweep freq. seems to be off calibrated at any special range:

Change capacitor
LBO-310,310A,311,511..C406-408
LBO-510 --- C-306-308

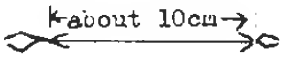
5) How to judge Good or No Good of CRT and V.H.- Amp. (No spot)

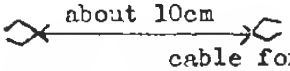


Refer voltage shown in diagram

Repair Power source

Ex. LBO-510 { V-Amp { Q208-C, Q209-C ; H-amp { Q305-C, Q306-C





cable for shorted test

Defective V.H. amp.

← Ex. Start from V-Amp. all way up to first stage if still spot not shown, leave the shorted cable at V-Amp as is and then start same thing at H-Amp.

Ex. LBO-510

208-C - Q-209-C

↓

Spot appeare

Shorted cable reposition

↓

Q206-C - Q207-C short

↓

Spot appeare

Shorted cable reposition

↓

Q204-C - Q205-C

↓

No Spot

↓

Q206, Q207 Check defective to change

Symptom 1)

Defective Horizontal Axis

* H-Amp Defective
* H-Amp Unstable
* H-Amp Low gain
* H-Position off linearity

* H-Pos Valiable instable
* H-Linearity bad
* H-Pos gradually shifts off
* H-Pos juma

LBO-510	LBO-511	LBO-310	LBO-311
Defective H-AMP Q305.306(2SC515) Q304(2SK34C)	Defective H-AMP Q301(2SK34C) Q302.303(2SC515)	Defective H-AMP Q301(2SK34C) Q302.303(2SC1012A)	Defective H-AMP Q301(2SK34C) Q302.303(2SC1012A)
Defective SWEEP OSC Q301.302(2SC458)	Defective SWEEP OSC Q401.402(2SC458)	Devective SWEEP OSC Q401.402(2SC458)	Devective SWEEP OSC Q401.402(2SC458)
+8V P.W.R. D 106(AW0108)	+8V P.W.R. D 104(AW0108)	+8V P.W.R. D 108(AW0108)	+8V P.W.R. D 108(AW0108)

Sympton 11)

NO Sweep

* Sweep unstable
* Wrong sweep wave form

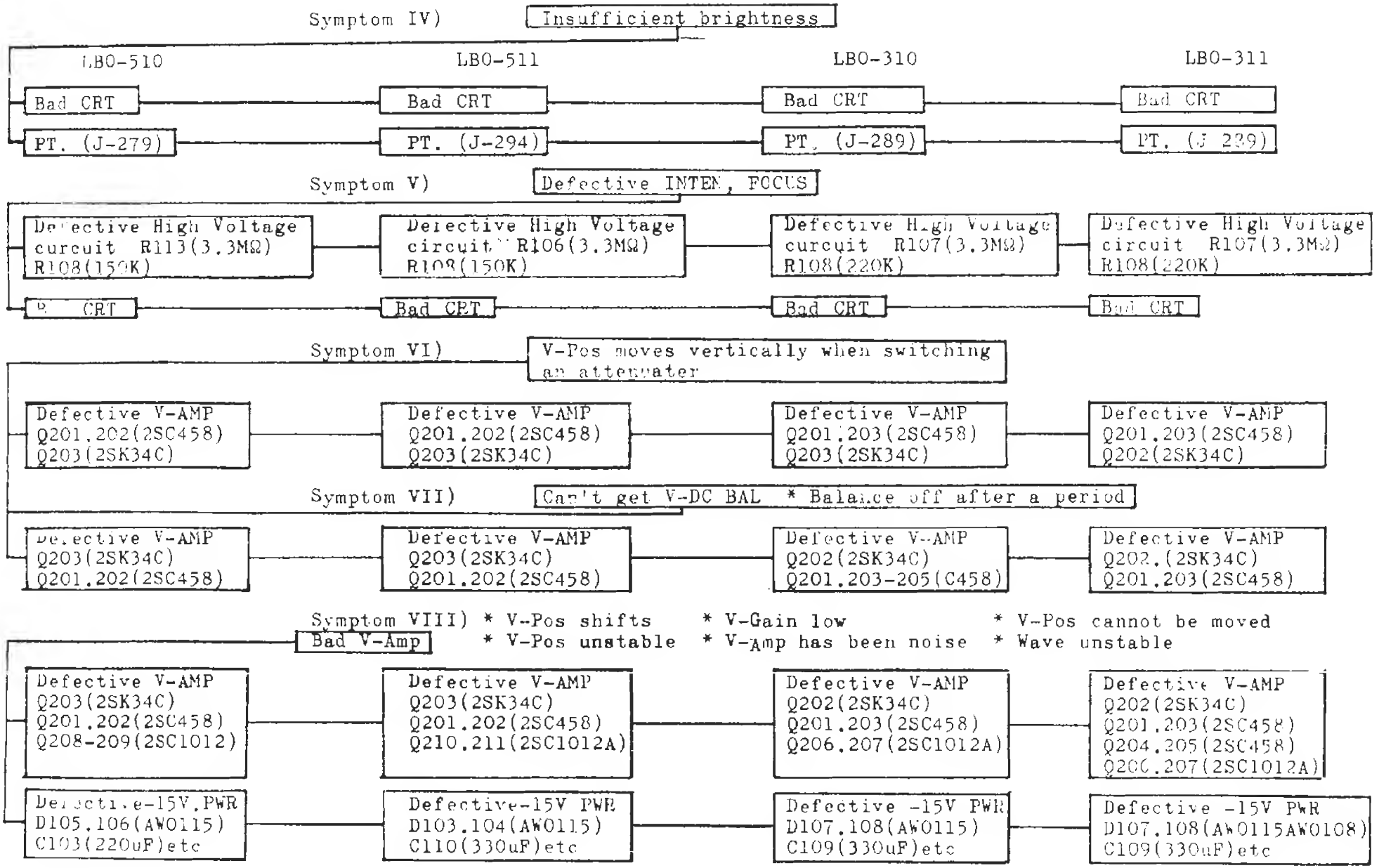
Defective SWEEP OSC Q301.302(2SC458) Q303(2SK34D) D301(1N60)	Defective SWEEP OSC Q401.402(2SC458) Q403(2SK34D) D401(1N60)	Defective SWEEP OSC Q401.402(2SC458) D401(1N60)	Defective SWEEP OSC Q401.402(2SC458) D401(1N60)
Defective H-AMP Q304(2SK34C)	Defective H-AMP Q301(2SK34C)	Defective H-AMP Q301(2SK34C)	Defective H-AMP Q301(2SK34C)

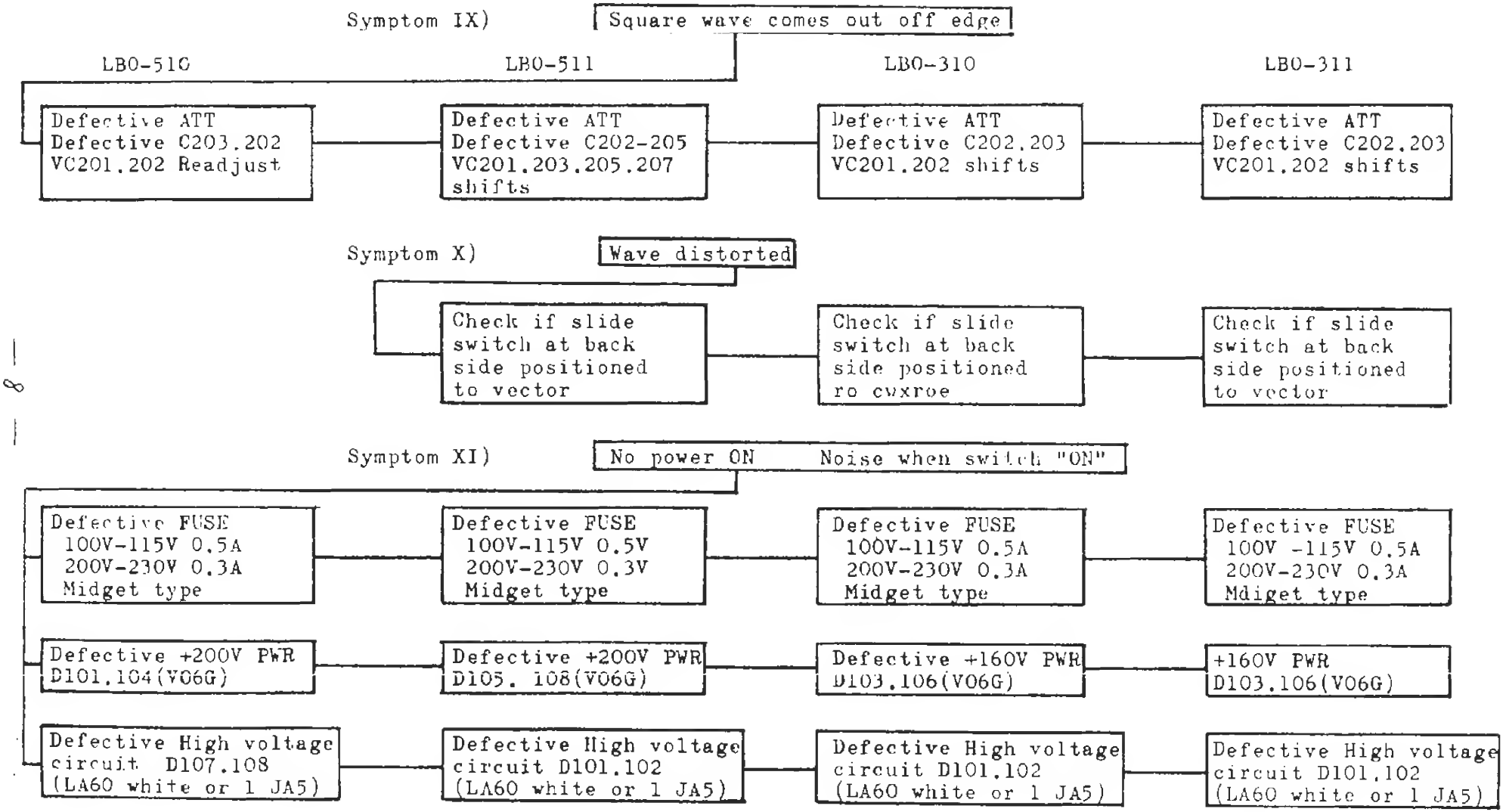
Symptom III)

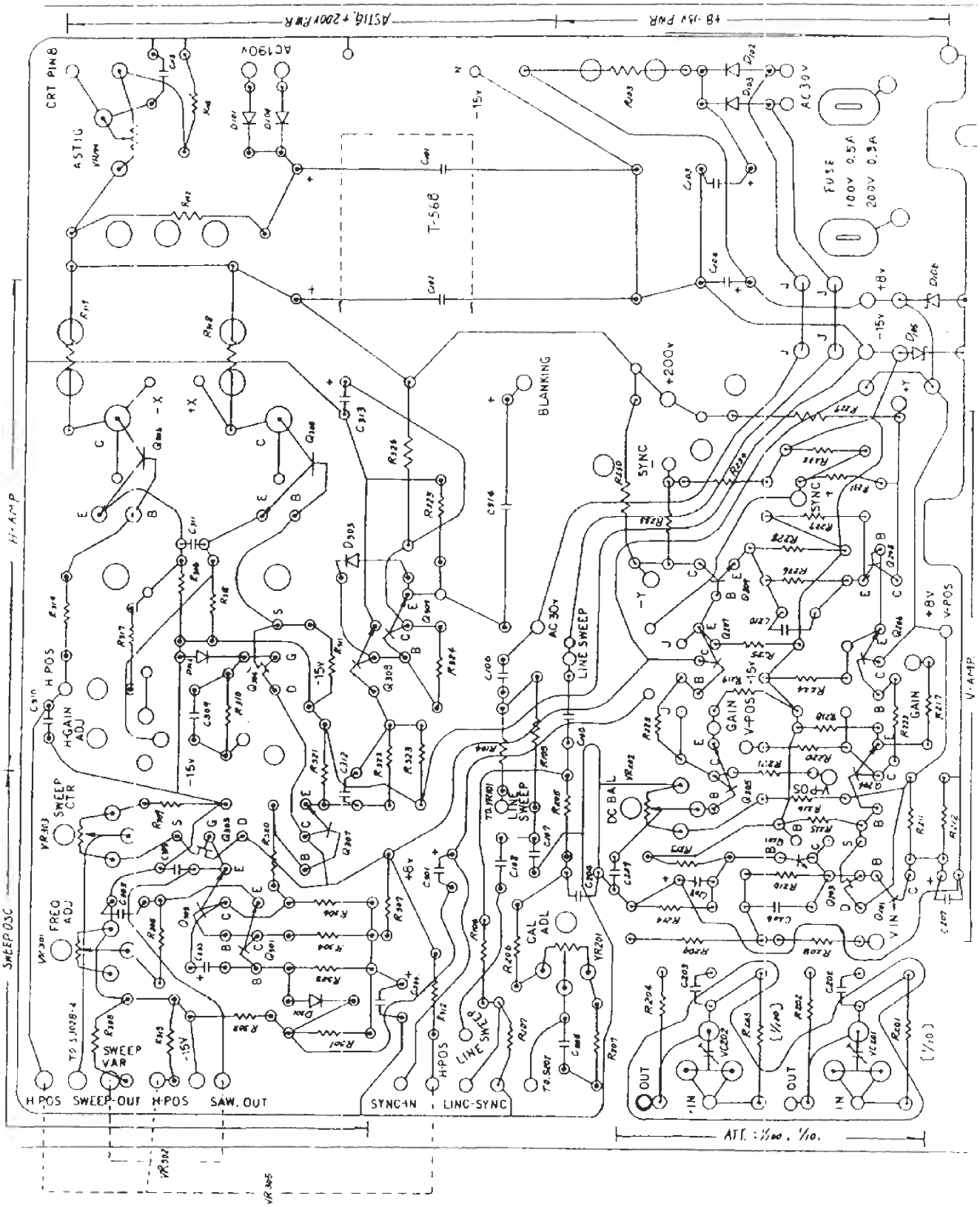
No Spot

* No trace line
* Doesn't work
* Spot fades off after a period.

LBO-510	LBO-511	LBO-310	LBO-311
Defective V-AMP Q210.202.204-207 (2SC458) Q203(2SK34C) Q208.209(2SC1012A)	Defective V-AMP Q201.202.204-209 (2SC458) Q210.211(2SC1012A) Q203(2SK34C)	Defective V-AMP Q201.203.-205 208.209(2SC458) Q202(2SK34C) Q206.207(2SC1012A)	Defective V-AMP Q201.203-205(2SC458) Q202(2SK34C) Q206.207(2SC1012A)
Defective CRT	Defective CRT	Defective CRT	Defective CRT
Defective H-AMP Q304(2SK34C) Q305.306(2SC515)	Defctive H-AMP Q301(2SK34C) Q302.303(2SC515)	Defctive H-AMP Q301(2SK34C) Q302.303(2SC1012A)	Defctive H-AMP Q301(2SK34C) Q302.303(2SC1012A)
Defective High Voltage circuit. D107.108 (LA60 white or 1 JA5) R108(150K)	Defective High Voltage circuit. D101.102(LA60 white or 1 JA5) R108(150K)	Defective High Voltage circuit. D101(LA60 white or 1 JA5) D102 R108(220K)	Defective High Voltage circuit. D101.102(LA60 white or 1 JA5) R108(220K)
Defective-15 P.W.R. D102.103(V06B) D105(AW0115)	Defective -15 P.W.R. D106.107(V06B) D103(AW0115)	Defective -15 P.W.R. D104.105(V06B) D107(AW0115)	Defective -15 P.W.R. D104.105(V06B) D107(AW0115)

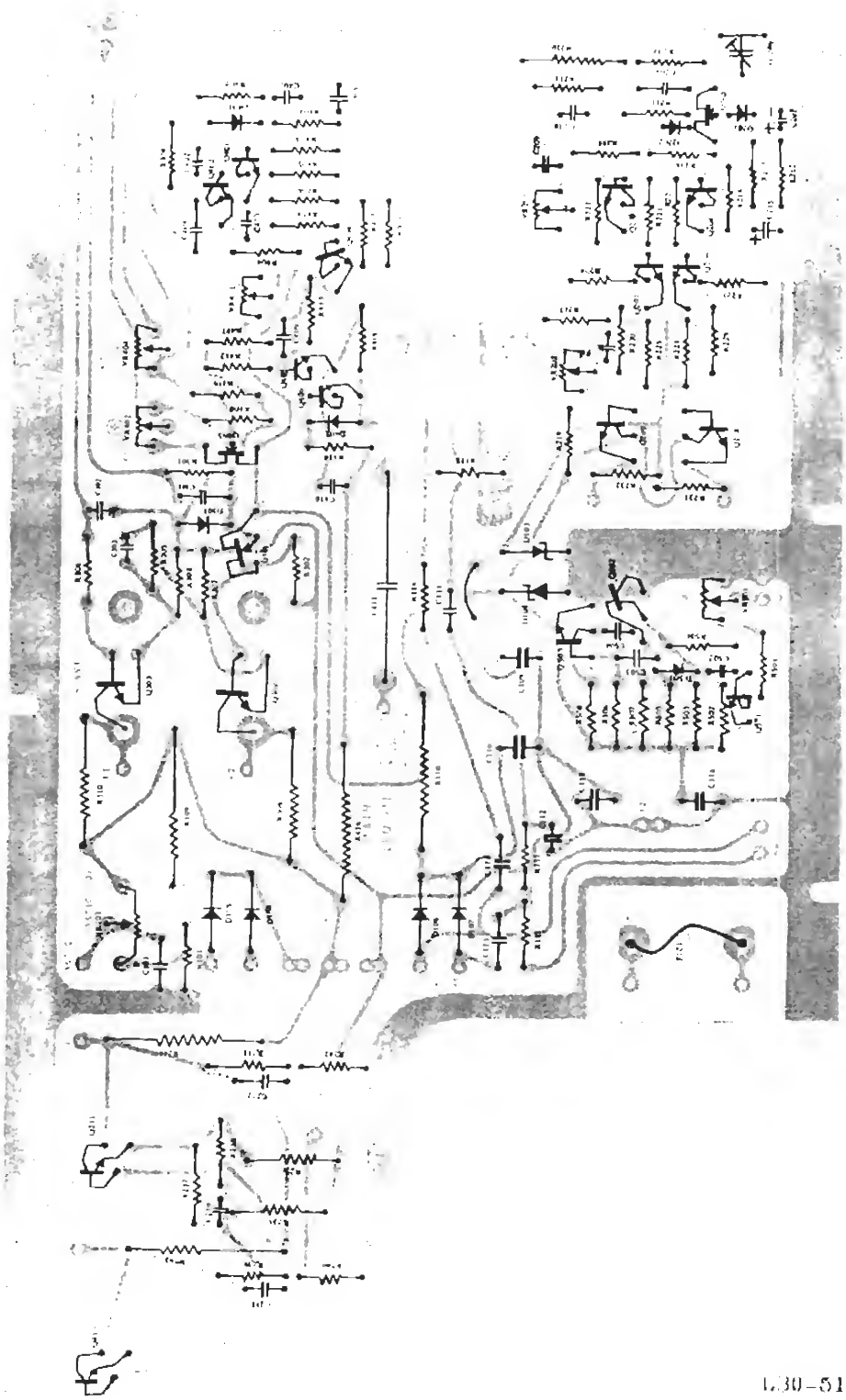

Symptom IV)
Insufficient brightness
LBO-510
LBO-511
LBO-310
LBO-311
Bad CRT
Bad CRT
Bad CRT
Bad CRT
PT. (J-279)
PT. (J-294)
PT. (J-289)
PT. (J-289)
Symptom V)
Defective INTEN, FOCUS
Defective High Voltage curcuit R113(3.3MΩ) R108(150K)
Defective High Voltage circuit R106(3.3MΩ) R108(150K)
Defective High Voltage curcuit R107(3.3MΩ) R108(220K)
Defective High Voltage circuit R107(3.3MΩ) R108(220K)
Bad CRT
Bad CRT
Bad CRT
Bad CRT
Symptom VI)
V-Pos moves vertically when switching an attenuater
Defective V-AMP Q201.202(2SC458) Q203(2SK34C)
Defective V-AMP Q201.202(2SC458) Q203(2SK34C)
Defective V-AMP Q201.203(2SC458) Q203(2SK34C)
Defective V-AMP Q201.203(2SC458) Q202(2SK34C)
Symptom VII)
Can't get V-DC BAL * Balance off after a period
Defective V-AMP Q203(2SK34C) Q201.202(2SC458)
Defective V-AMP Q203(2SK34C) Q201.202(2SC458)
Defective V-AMP Q202(2SK34C) Q201.203-205(C458)
Defective V-AMP Q202.(2SK34C) Q201.203(2SC458)
Symptom VIII)
* V-Pos shifts
* V-Pos unstable
* V-Gain low
* V-Amp has been noise
* V-Pos cannot be moved
* Wave unstable
Bad V-Amp
Defective V-AMP Q203(2SK34C) Q201.202(2SC458) Q208-209(2SC1012)
Defective V-AMP Q203(2SK34C) Q201.202(2SC458) Q210.211(2SC1012A)
Defective V-AMP Q202(2SK34C) Q201.203(2SC458) Q206.207(2SC1012A)
Defective V-AMP Q202(2SK34C) Q201.203(2SC458) Q204.205(2SC458) Q206.207(2SC1012A)
Defective-15V PWR D105.106(AW0115) C103(220uF)etc
Defective-15V PWR D103.104(AW0115) C110(330uF)etc
Defective -15V PWR D107.108(AW0115) C109(330uF)etc
Defective -15V PWR D107.108(AW0115AW0108) C109(330uF)etc


Symptom IX)
Square wave comes out off edge
LB0-510
LB0-511
LB0-310
LB0-311
Defective ATT
Defective C203.202
VC201.202 Readjust
Defective ATT
Defective C202-205
VC201.203.205.207
shifts
Defective ATT
Defective C202.203
VC201.202 shifts
Defective ATT
Defective C202.203
VC201.202 shifts
Symptom X)
Wave distorted
Check if slide
switch at back
side positioned
to vector
Check if slide
switch at back
side positioned
ro cuxroe
Check if slide
switch at back
side positioned
to vector
Symptom XI)
No power ON
Noise when switch "ON"
Defective FUSE
100V-115V 0.5A
200V-230V 0.3A
Midget type
Defective FUSE
100V-115V 0.5V
200V-230V 0.3V
Midget type
Defective FUSE
100V-115V 0.5A
200V-230V 0.3A
Midget type
Defective FUSE
100V -115V 0.5A
200V-230V 0.3A
Mdiget type
Defective +200V PWR
D101.104(V06G)
Defective +200V PWR
D105. 108(V06G)
Defective +160V PWR
D103.106(V06G)
+160V PWR
D103.106(V06G)
Defective High voltage
circuit D107.108
(LA60 white or 1 JA5)
Defective High voltage
circuit D101.102
(LA60 white or 1 JA5)
Defective High voltage
circuit D101.102
(LA60 white or 1 JA5)
Defective High voltage
circuit D101.102
(LA60 white or 1 JA5)


CRT PIN 8
AC190V
AC 30V
FUSE
100V 0.5A
200V 0.5A
T-568
+8V
-15V
+200V
BLANKING
SYNC
H POS
H GAIN ADJ
SWEEP CTR
FREQ ADJ
SWEEP VAR
DC BAL
CAL ADJ
LINE SWEEP
V-POS
GAIN
V-AMP
H-AMP
SWEEP OSC
H POS
SWEEP-OUT
H POS
SAW. OUT
SYNC-IN
LINE-SYNC
ATT. : 1/100 , 1/10.
OUT
IN

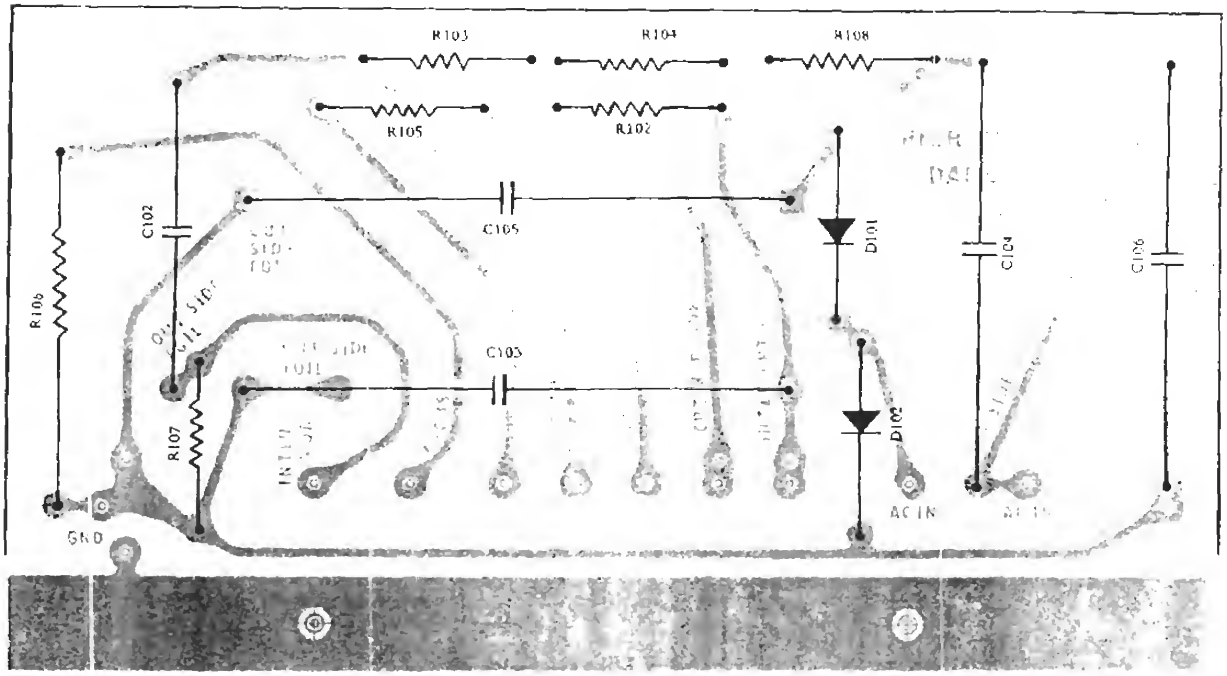
LBO-510
C110 0.1μ
OUT SIDE FOIL
GND
CUT SIDE FOIL
C109 0.1μ
T-470
ACIN
D108 LA60B
R108 150K
INTEN GRT.B
GRT.K.BLANK
INTEN
GRT.G1
R111 68K
R109 470K
C111 0.1μ
C114 0.1μ
FOCUS
FOCUS
R110 470K
R112 470K
OUT SIDE FOIL
INTEN MOD
OUT SIDE FOIL
R114 1MΩ
C112 0.022
GND
R113 3.3K

T-669 MAIN

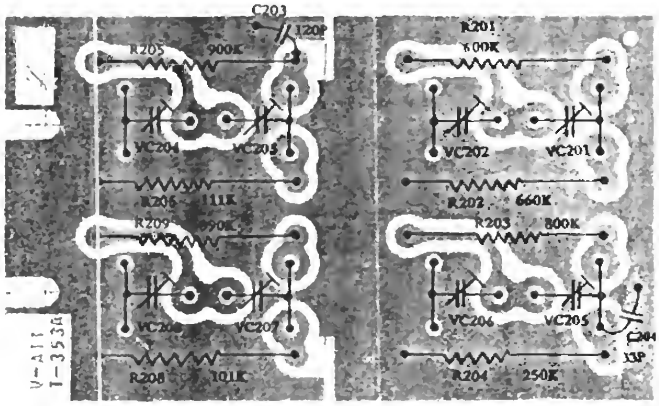


L30-511

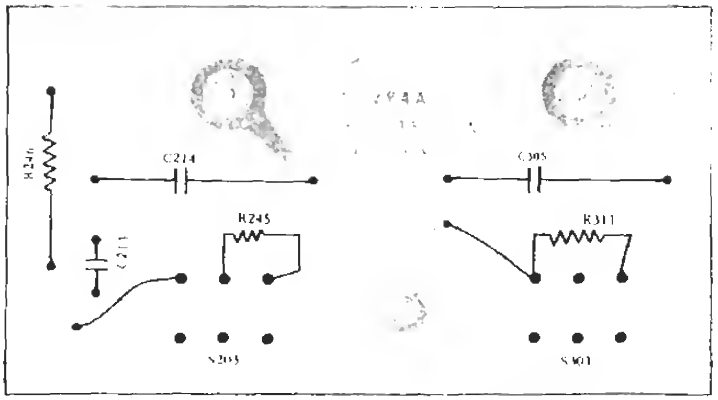
T-670 HIGH VOLT RECT



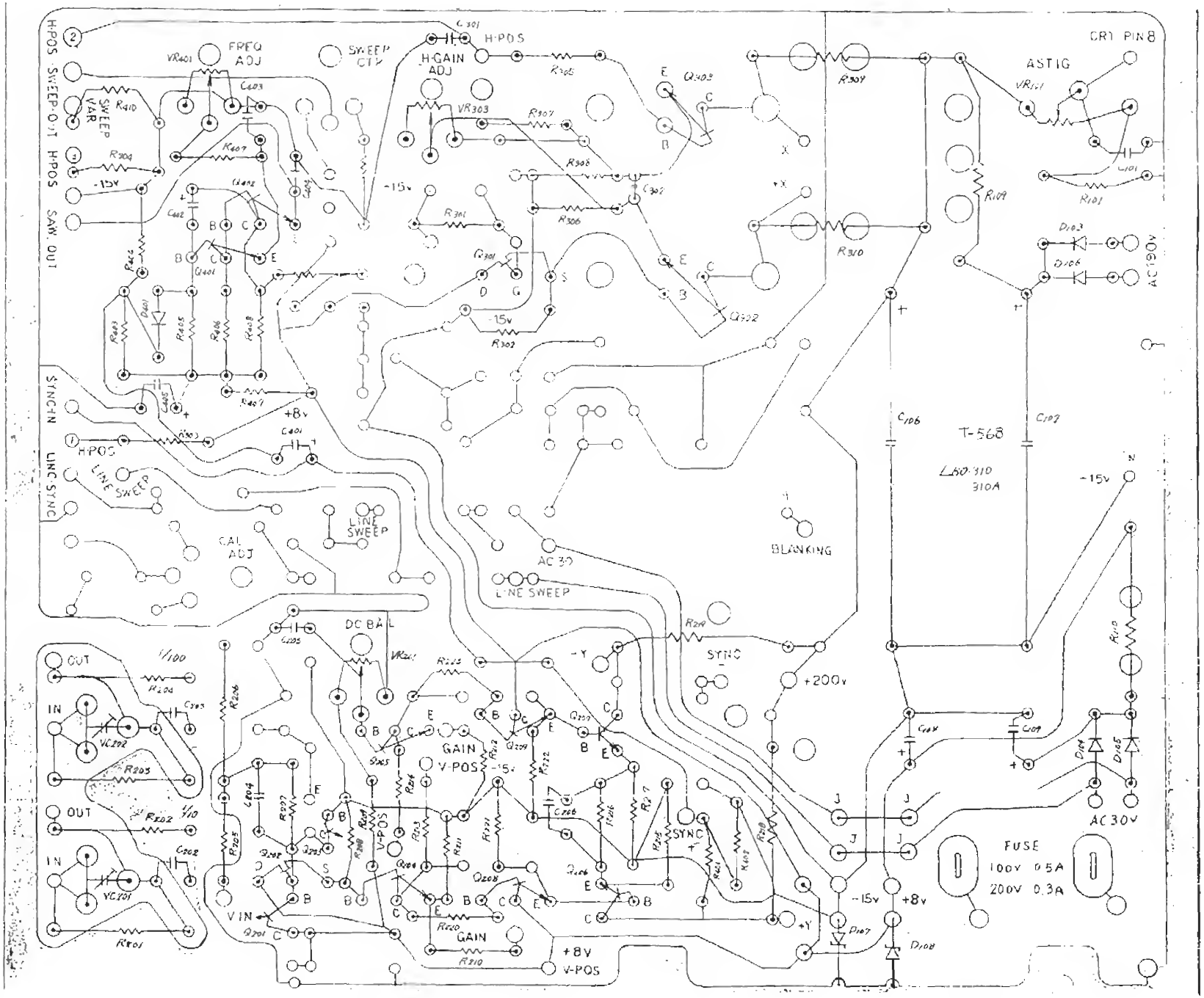
T-353A V-ATT

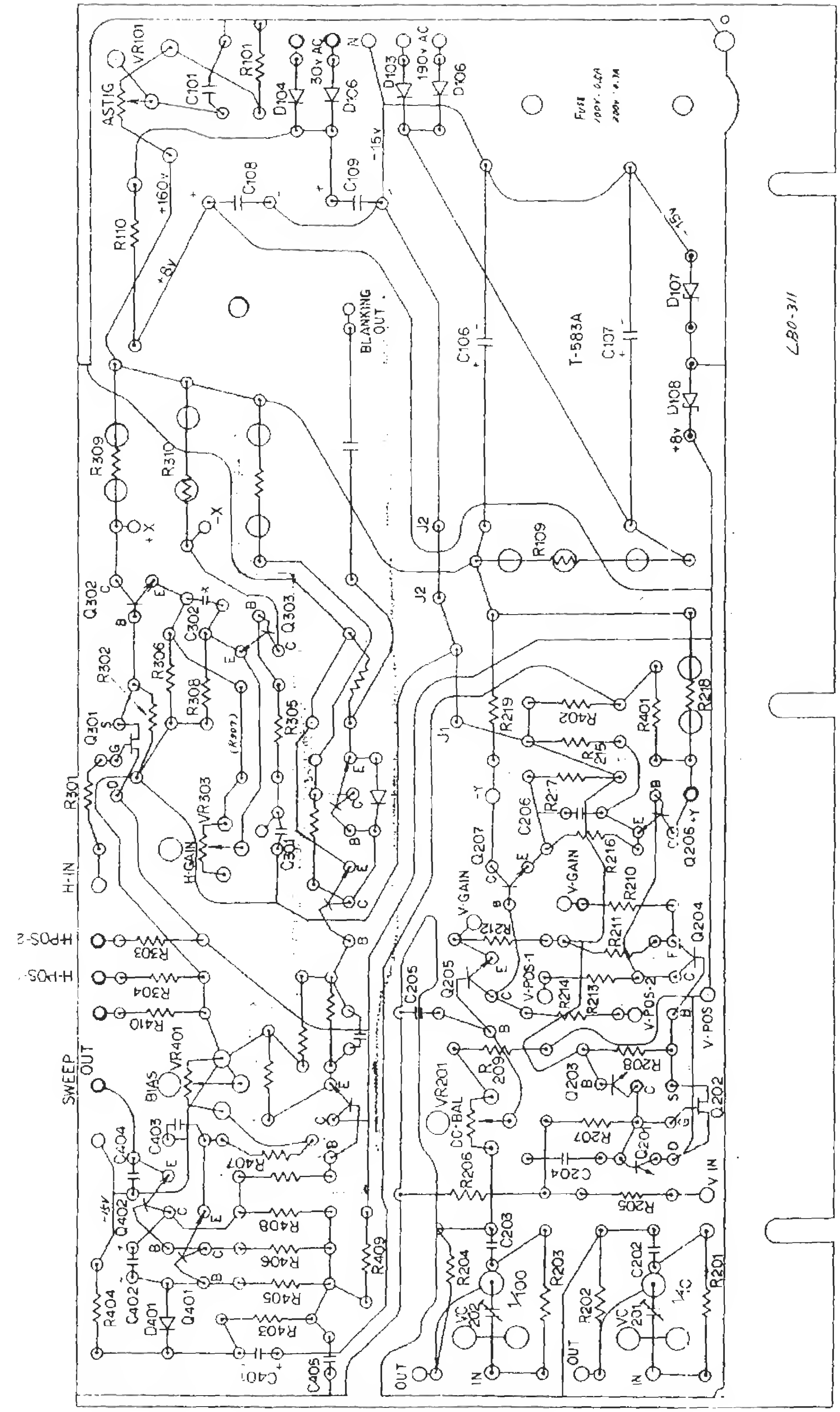


T-294A VECTOR SCOPE

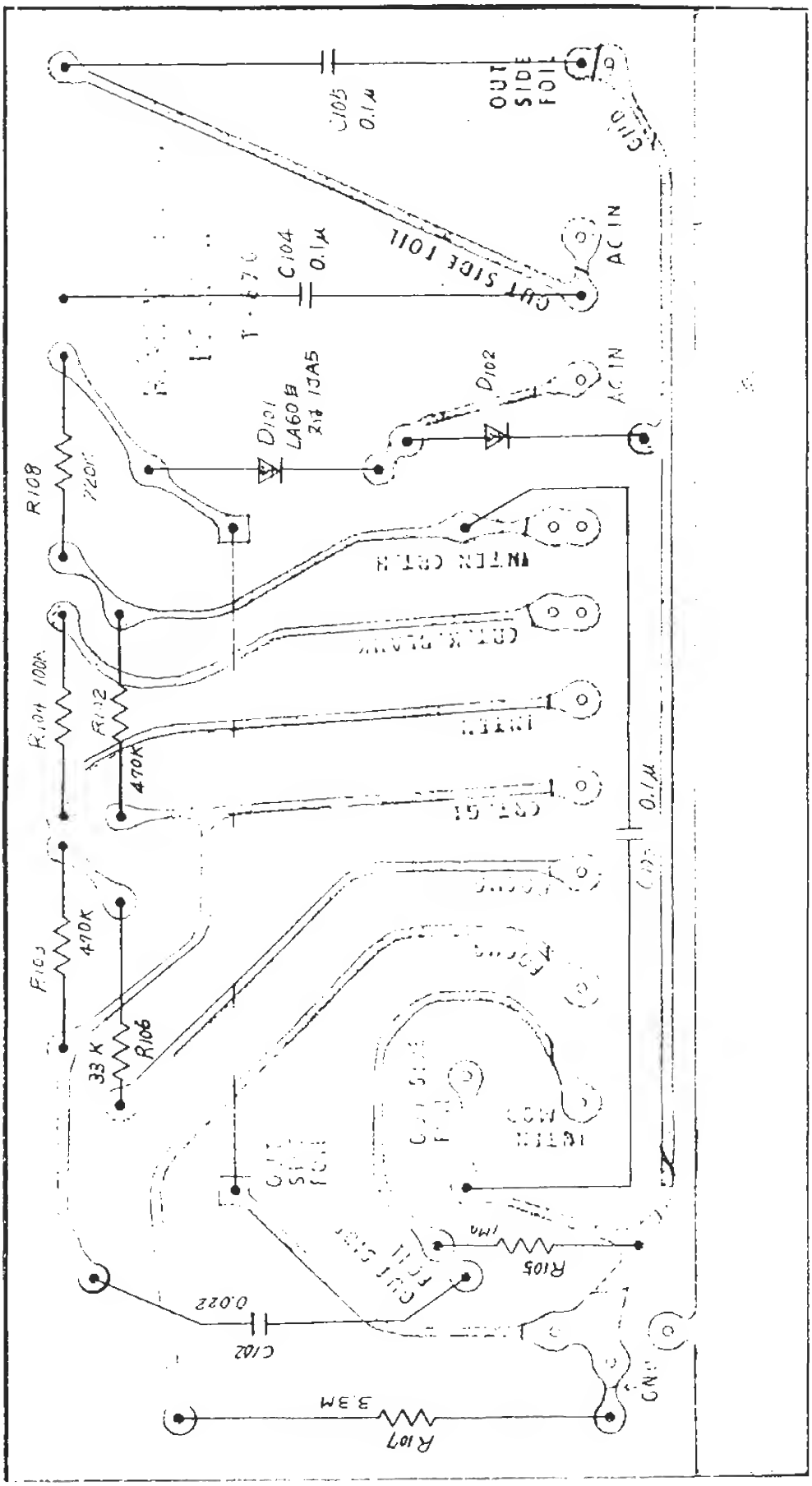


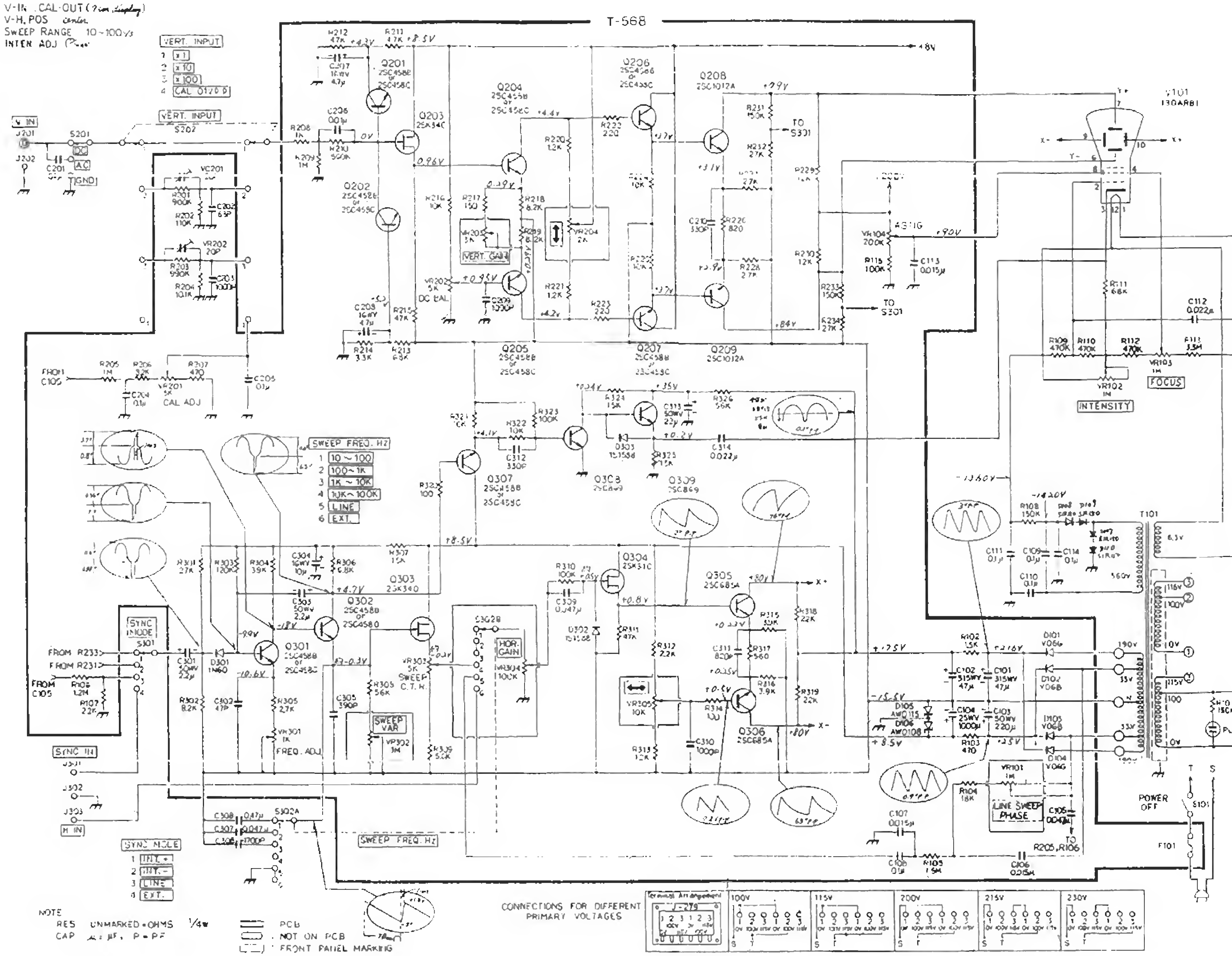
LBO-511

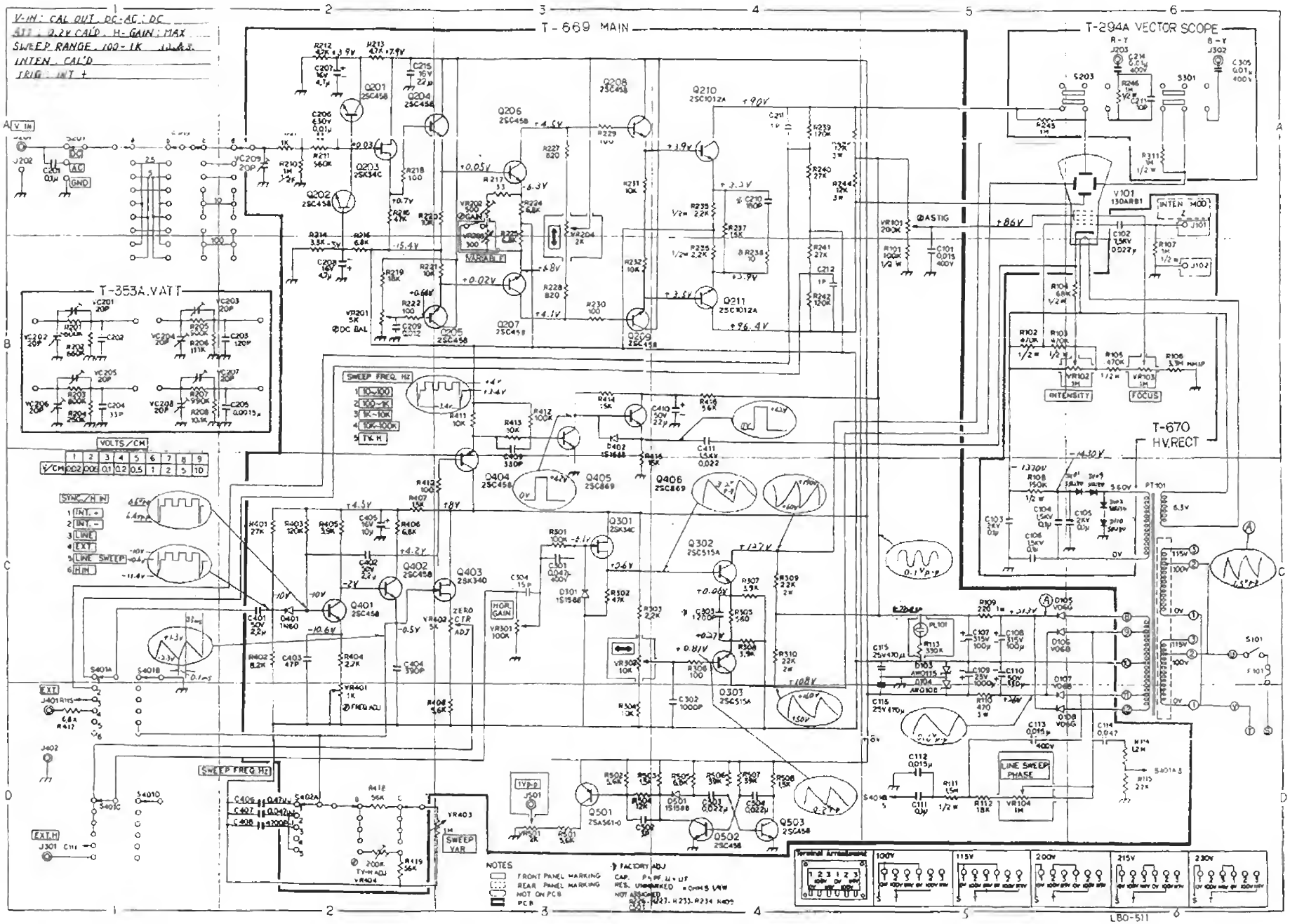

H-POS
SWEEP O/P
H-POS
SAW OUT
SYNC IN
LINE SYNC
FREQ ADJ
SWEEP CTV
H-GAIN ADJ
H-POS
SWEEP VAR
-15v
+8v
HPOS
LINE SWEEP
CAL ADJ
LINE SWEEP
AC 30
LINE SWEEP
DC BAL
BLANKING
SYNC
+200v
GAIN
V-POS
VIN
GAIN
+8v
V-POS
-Y
+Y
CRT PIN 8
ASTIG
T-568
L60-310
310A
AC 30v
FUSE
100V 0.5A
200V 0.3A
OUT
IN
OUT
IN

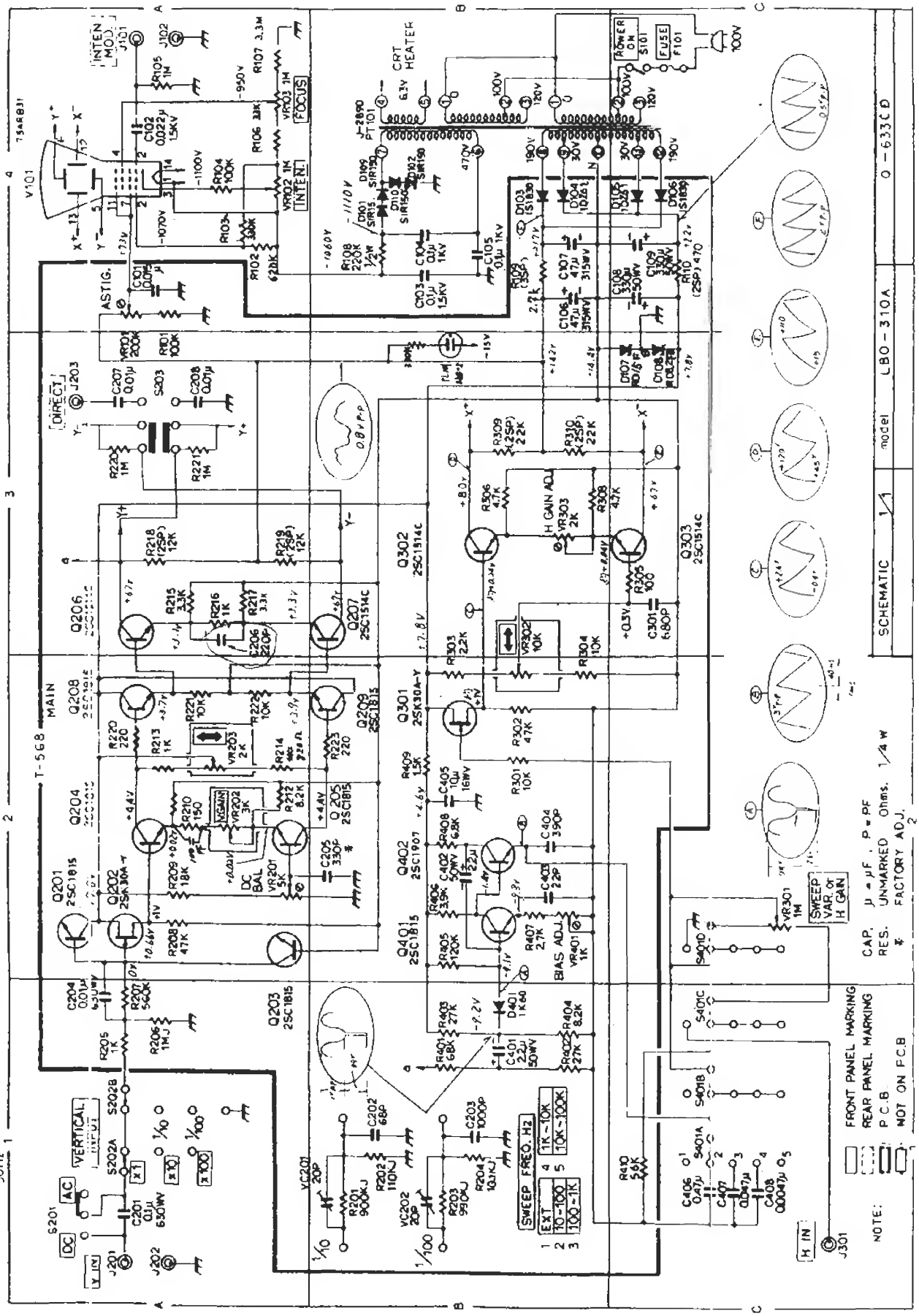


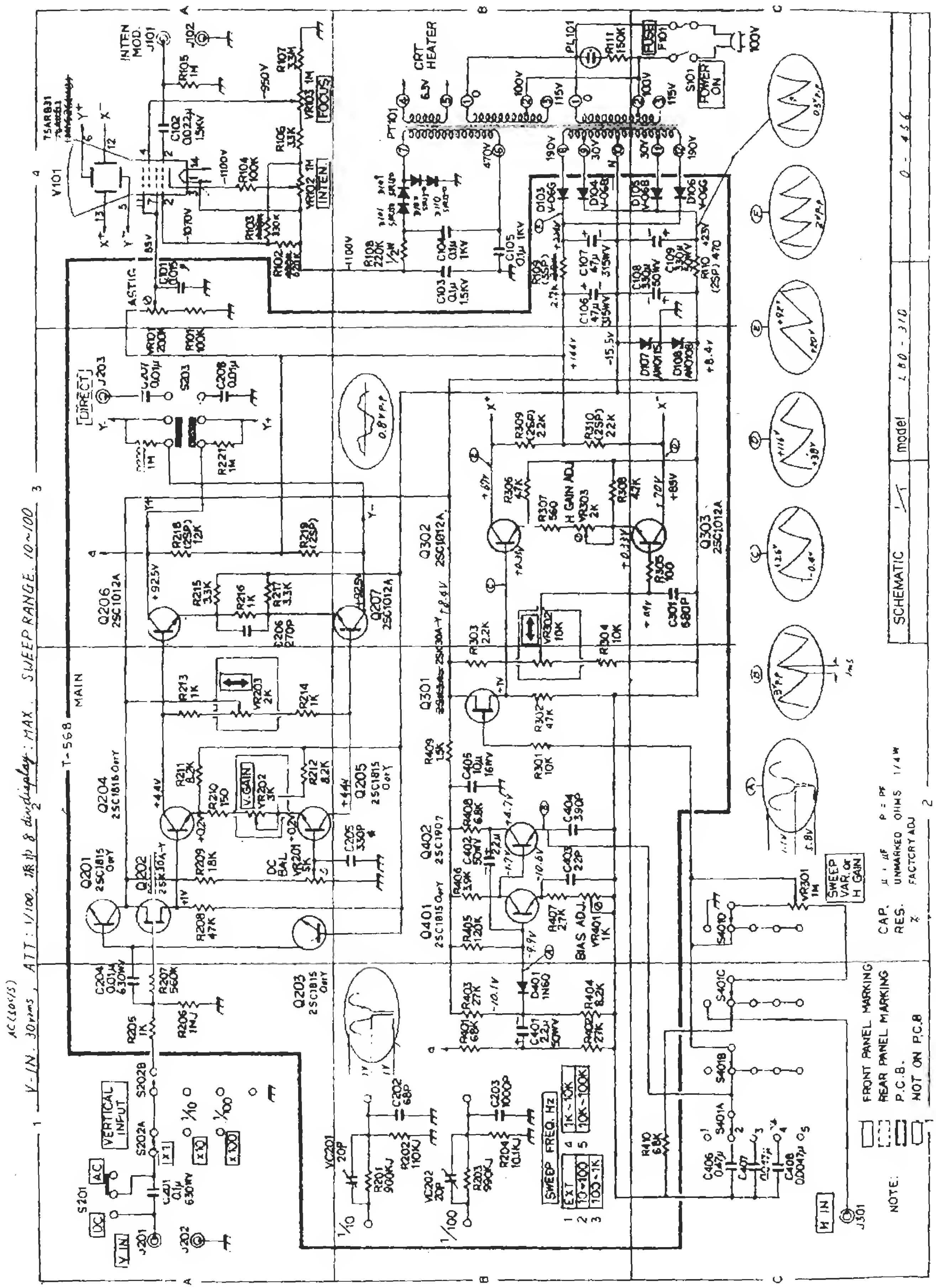
LBO-311
T-583A
BLANKING OUT
ASTIG
VR101
H-GAIN
V-GAIN
DC-BAL
BIAS
SWEEP OUT
H-IN
V IN
V-POS
+160v
+8v
-15v
30v AC
190v AC


C105
0.1μ
OUT SIDE FOIL
C103
C104
0.1μ
CUT SIDE FOIL
AC IN
D101
LA60B
Zd 13A5
D102
AC IN
R108
120K
R104 100K
R102
470K
R103
470K
33K
R106
0.1μ
C101
R105
1MΩ
C102
0.022
R107
3.3M


T-568
VERT. INPUT
SWEEP FREQ. Hz
SYNC MODE
SYNC IN
H IN
VERT. GAIN
DC BAL
CAL ADJ
FREQ. ADJ
SWEEP VAR
HOR. GAIN
INTENSITY
FOCUS
INTEN MOD
LINE SWEEP PHASE
POWER OFF
CONNECTIONS FOR DIFFERENT PRIMARY VOLTAGES
NOTE
RES UNMARKED = OHMS 1/4w
PCB
NOT ON PCB
FRONT PANEL MARKING


T-669 MAIN
T-294A VECTOR SCOPE
T-353A.VATT
T-670 H.V.RECT
V-IN : CAL OUT, DC-AC : DC
ATT : 0.2V CAL'D, H-GAIN : MAX
SWEEP RANGE : 100 - 1K
INTEN : CAL'D
TRIG : INT +
V IN
DC
AC
GND
SWEEP FREQ Hz
10-100
100-1K
1K-10K
10K-100K
TV-H
VOLTS/CM
SYNC/H IN
INT. +
INT. -
LINE
EXT
LINE SWEEP
H-IN
EXT
EXT.H
SWEEP VAR
HOR. GAIN
ZERO CTR ADJ
FREQ ADJ
TV-H ADJ
INTENSITY
FOCUS
ASTIG
DC BAL
LINE SWEEP PHASE
NOTES
FRONT PANEL MARKING
REAR PANEL MARKING
NOT ON PCB
PCB
FACTORY ADJ
Terminal Arrangement
100V
115V
200V
215V
230V
LBO-511


V-IN AC 100V, ATT 1/100 : 6 div display SWEEP RANGE : 2 cycle display
50Hz
T-568
MAIN
SCHEMATIC 1/1
model LBO-310A
0-633CD
CAP. μ = μF, P = PF
RES. UNMARKED Ohms. 1/4 W
* FACTORY ADJ.
NOTE: FRONT PANEL MARKING
REAR PANEL MARKING
P.C.B
NOT ON P.C.B
VERTICAL
SWEEP FREQ. H2
SWEEP VAR or H GAIN
H GAIN ADJ
BIAS ADJ.
DC BAL
ASTIG.
FOCUS
INTEN
INTEN MOD.
DIRECT
CRT HEATER
POWER ON S101
FUSE F101
H IN


SCHEMATIC
model L80-310
NOTE:
FRONT PANEL MARKING
REAR PANEL MARKING
P.C.B.
NOT ON P.C.B
CAP. μ : μF P : PF
RES. UNMARKED OHMS 1/4W
FACTORY ADJ
MAIN
T-568

<L80-310>